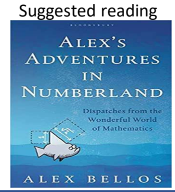
Year 9 – Reasoning with Proportion
Solve Ratio & Proportion Problems

Suggested reading



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What do I need to be able to do?

By the end of this unit you should be able to:

- Solve problems with direct proportion
- Use conversion graphs
- Solve problems with inverse proportion
- Solve ratio problems
- Solve 'best buy' problems

Keywords

Proportion: a comparison between two numbers

Ratio: a ratio shows the relative size of two variables

Direct proportion: as one variable is multiplied by a scale factor the other variable is multiplied by the same scale factor.

Inverse proportion:: as one variable is multiplied by a scale factor the other is divided by the same scale factor.

Direct Proportion

As one variable changes the other changes at the same rate.

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4 cans of pop = £2.40

This is a multiplicative change

4 cans of pop = £2.40 → ÷ 0.5 / x 0.5 → 2 cans of pop = £1.20

This multiplier is the same In the same way that this would be for ratio

4 cans of pop = £2.40 → x 3 → 12 cans of pop = £7.20

Sometimes this is easiest if you work out how much one unit is worth first eg. 1 can of pop = £0.60

Conversion Graphs

Compare two variables

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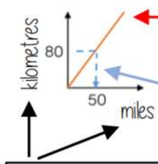

This is always a straight line because as one variable increases so does the other at the same rate

Labelling of both axes is vital

To make conversions between units you need to find the point to compare – then find the associated point by using your graph

Using a ruler helps for accuracy

Showing your conversion lines help as a "check" for solutions

Inverse Proportion

As one variable is multiplied by a scale factor the other is divided by the same scale factor

Examples of inversely proportional relationships

Time taken to fill a pool and the number of taps running

Time taken to paint a room and the number of workers

T is inversely proportional to G. When T=2 then G=20

÷ 2   × 4

T	1	2	8
G	40	20	5

× 2   ÷ 4

Best Buys

Have a directly proportional relationship

To calculate best buys you need to be able to compare the cost of one unit or units of equal amounts

Shop A: 4 cans for £1.20 → **£1.20 ÷ 4** → 1 can is £0.30 Or 30p

Shop B: 3 cans for 93p → **£0.93 ÷ 3** → 1 can is £0.31 Or 31p

Cost per item

Shop **A** is the best value as it is 1p cheaper per can of pop

Shop A: 4 cans for £1.20 → **4 ÷ £1.20** → £1 buys 3.333 cans of pop

3 cans for 93p → **3 ÷ £0.93** → £1 buys 3.23 cans of pop

Cost per pound

Shop **A** is still shown as being the best value but pay attention to the unit you are calculating, per item or per pound

Best value is the most product for the lowest price per unit

Sharing a whole into a given ratio

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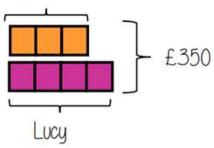
James and Lucy share £350 in the ratio 3:4
Work out how much each person earns

Model the Question

James: Lucy
3 : 4



Find the value of one part

Whole: £350
7 parts to share between
(3 James, 4 Lucy)

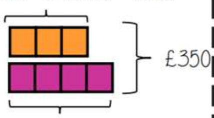
£350 ÷ 7 = £50

☐ = one part = £50

Put back into the question

James: Lucy
3 : 4 (x 50, x 50)
£150:£200

James = 3 x £50 = £150



Lucy = 4 x £50 = £200

Finding a value given 1:n (or n:1)

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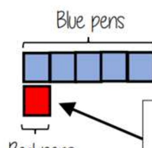
Inside a box are blue and red pens in the ratio 5:1
If there are 10 red pens how many blue pens are there?

Model the Question

Blue : Red
5 : 1



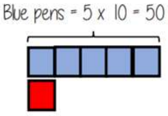
☐ = one part = 10 pens

One unit = 10 pens

Put back into the question

Blue : Red
5 : 1 (x 10, x 10)
50: 10

Blue pens = 5 x 10 = 50 pens



Red pens = 1 x 10 = 10 pens

There are 50 Blue Pens